ASSOCIATE EXTERNAL OPHTHALMOPLEGIA OR UNCOMPLICATED PARALYSIS OF THE EXTERNAL MUSCLES OF BOTH EYES.[1]

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PARALYTIC affections of the muscles of the eye are becoming daily of more importance, whether occurring separately or in conjunction with other affections, because they are of such great help in locating lesions of the brain. Thanks to the labors of Hensen and Voelcker in 1878, the location of the nuclei of the principal motor nerves of the eye are known to us; and many features of paralytic affections of these nerves, that before appeared mysterious, are now more readily understood, and I hope the time will not be distant when the ultimate origin of these nerves can be definitely traced to the gray matter of the cortex. At present there is great confusion in this respect, as some observers, like Munk and Carville, locate the centre of motion for the eye in the angulus gyrus; others, like Hensen and Voelcker,[2] look for it in the temporal lobe, and Hitzig in the convolutions of the frontal lobe.

There is, however, no doubt that in many instances paralysis of the ocular muscles is caused by lesions in the nuclei which are found in the floor of the third and fourth ventricles and in the iter connecting them. Of the greatest interest are those lesions of the third or motor oculi nerve which result in paralysis of a portion of this complicated nerve, leaving other parts of it intact. The most striking

[1] There has been some delay in the reproduction of illustrations accompanying this article. They will appear in the next number of the Journal.—EDIT.

[2] v. Græfe's Archiv, xxiv., 1, pagina 1, 1878.

of these are those cases in which only the internal muscles of the eye, supplied by the third nerve, the sphincter of the iris, and the ciliary muscles are affected, or still more so those in which only the external muscles of the eye supplied by the third or motor nerve are implicated. These cases go to prove that there must be separate nuclei for the different parts of the nerve going to the separate muscles, and that there is a distinct origin for those fibres going to the internal, and those going to the external muscle.

It must not be forgotten that there are two eye muscles which are not supplied by the third nerve, but that the nerves going to them arise from nuclei in close proximity to those parts of the third nerve which supply the external ocular muscles. These different nuclei are separated from each other in such a way that one of them may become the seat of disease without the neighboring nuclei being affected, but, on the other hand, lesions may readily extend from one to the other until quite a number of them are diseased. This occurs, in fact, often enough during the growth of tumors developing in these regions, and as new nuclei become involved, new additions to an existing paralysis will be observed, until eventually all the muscles of one or even of both eyes may become paralyzed in this manner. This is by no means so very rare in persons affected with syphilis or tumors of the brain.

Of greater scarcity, however, are those cases where, in a comparatively short space of time, all the muscles of both eyes, with the exception of those in the interior of the eyeball, become paralyzed. The first one of this kind was described by the illustrious v. Graefe, in February, 1868. In his clear and concise description of the case, all the characteristic symptoms of this rare affection are admirably presented, and it was he who gave this affection the name of ophthalmoplegia externa.

The English literature has no mention of the affection until J. Hutchinson, in 1879, only seven years ago, reports a number of cases, seventeen in all, of which, however, only a limited number, three, belong to this class. In his

usual clear way, he describes the different forms of ocular paralysis; he speaks first of an ophthalmoplegia interna and externa, but the particular form, the plain, uncomplicated ophthalmoplegia externa of both eyes, is hardly sufficiently appreciated, nor is its pathology clearly understood. Great credit is due to Förster, who was the first to locate the seat of the lesion in the floor of the aqueductus Sylvii, which was apparently proven by an autopsy in one of Hutchinson's cases. I say apparently, because this was in a case complicated by other paralytic lesions, especially that of the internal muscles of the eye. Perinaud was the first to point out this difference in the lesions of ophthalmoplegia externa and interna, and in 1884, Dr. Birdsall, of New York, in reporting two cases of this kind, emphasizes that the lesion must affect the posterior nuclei of the third and those of the fourth and sixth nerve.

Of the greatest importance, however, is the admirable paper on the subject by Prof. Mauthner, of Vienna. In reporting three cases of this kind, he proves in a very able manner the great probability of the lesion being in the region pointed out by Förster and Birdsall; he thinks that a poliencephalitis, similar to a disease of the gray ant. horns of the spine, which Kussmaul has named poliomyelitis, is the most probable condition to give rise to the disease.

What evidence have we got to prove the correctness of this theory?

Of post-mortem examinations, we have only four that belong to this class. Of these, the first one is that of a case of A. v. Graefe. But this patient, who had syphilis, and suffered from drowsiness and headache, and about whose pupils and accommodation nothing is known, and who eventually died of bulbar paralysis, presented nothing abnormal; at least no evidence of a gross lesion was found.

The second one is that of Goyet; he found hyperæmia and partial softening involving the iter and the floor of the fourth ventricle; the floor of the third ventricle, and consequently the nuclei of accommodation and of the sphincter being normal; but *this was likewise a case compli-*

cated with drowsiness, general atony of the muscles, and hemiplegia of the right side.

The third is that by Gowers, of one of Hutchinson's cases. This case is one of syphilis in which the *internal muscles of the eye were affected at the same time.* Here a degeneration of the nuclei similar to that observed in the spinal nerves in progressive muscular atrophy was found.

The fourth one is that by Bristowe, of a case of F. Warner. This history is of such interest that I shall report it here. Marion H., 25 years, began to have scanty menstruation and Graves' disease in 1877. 1880 she had diplopia, and a little later the eyes became fixed, and in 1881 dyspnœa and vomiting troubled her. Dr. Warner reported her case in 1882. Shortly after this she came under Bristowe's care. She had now epileptic fits, followed by paralysis and rigidity of the left leg and arm with increase of temperature. No optic neuritis; nor was the iris or the accommodation impaired in the least. A little later she died of bronchitis. The result of the post mortem examination is as follows: *No visible* changes of any part of the cord or brain or intracranial tissue could be detected. In the hardened specimens, no morbid change could be discovered on microscopical examination, except some small, pale-yellow patches, not differing, however, from the normal structure, except by their color. These spots were found in the gray as well as in the white matter of the brain, and appeared to be local areas of anæmia, as they are sometimes met with in otherwise normal brains. They were found especially, 1st, in the cortex of the third left transverse frontal convolution; 2d, in the anterior extremity of the left lenticular nucleus; 3d, in the internal capsule of the adjoining posterior portion of the left lenticular nucleus. Microscopic examination showed the nuclei of the sixth and seventh nerve, as well as the corpora quadrigemina, normal. The nuclei of the third nerve were not examined by mistake. The left third frontal convolution itself, as well as the rest of the brain, as well as the medulla, the spinal cord, as well as the sympathetic nerves, were healthy.—It is unfortunate

that the third nerve nuclei were not examined, but as those of the abducens were perfectly normal, these were probably so.

Here we have four autopsies, and in every one of them the ophthalmoplegia externa had been complicated with other brain or nervous symptoms ; they are therefore not conclusive in regard to the pathological lesion of this rare disease. In fact, there has not been so far a single post-mortem evidence of the lesion, which gives rise to uncomplicated ophthalmoplegia externa of both eyes. The evidence so far seems to point to a nuclear change, but whether this is due to anæmia or hyperæmia, or to a special malnutrition, or whether we have to look for a lesion of the gray matter of the cortex representing a centre for the movements of the eye, the existence of which is even doubtful at the present time, the future will have to decide. So much is apparent that the lesion causing this disease cannot be fascicular, nor basal, nor orbital. The knowledge of the disease is, however, of such recent date, and the affection itself is so rare, that this fault seems to be excusable. In fact, there have been only about thirty cases of this kind recorded.

A. v. Graefe	reported	3 cases.
M. Benedict	"	1 case.
C. Schroeder	"	1 "
Alfred Graefe	"	3 cases.
Goyet	"	2 "
Camuset	"	1 case.
E. Raehlmann	"	1 "
J. Hutchinson	"	3 cases.
Buzzard	"	2 "
Lichtheim	"	1 case.
Foerster	"	3 cases.
Mauthner	"	3 "
Uthoff	"	3 "
F. Warner	"	1 case.
J. Hook	"	1 "
J. Bristowe	"	1 "
W. R. Birdsall	"	2 cases.

Mittendorf	reported	1 case.
Bull	"	2 cases.
Strümpell	"	1 case.

Going carefully over all these cases, I found that eleven were complicated by paralytic affections of other muscles or with marked nervous lesions, and only twenty-two were of the typical form, and occurring in perfectly healthy individuals.

Time of the Attack.—This appears to be especially between the ages of fifteen and forty years. Sometimes the affection appears to be congenital, and it may come on as late as fifty-five or sixty.

Sex.—This does not seen to make much difference, a number of the cases occurring in young girls.

The duration seems to be indefinite. Mauthner reports one case that remained unchanged for twenty years. Alfred Graefe, one of fifteen years' standing; A. v. Graefe, one that lasted very long, and the case I wish to call your attention to has remained practically unchanged for three years. Strümpell mentions another of twenty-five years' standing.[1]

The etiology of the affection seems to be as uncertain as the exact seat of its lesion. It appears to attack persons in perfect health; but in many of the cases a specific history seems to exist. Traumatism may give rise to it, and it may be congenital.

The mode of attack is, as a rule, slow; in most of the cases the motor oculi suffer first; in some the external recti are first affected. It takes generally several months before all the muscles are affected.

Complications do, as a rule, not exist, and the patients may enjoy perfectly good health otherwise. It has been observed that during the existence of the trouble, epileptic attacks come on, that bulbar paralysis, and sometimes general progressive muscular atrophy followed. Locomotor ataxia has been observed in some cases. In v. Graefe's case, bulbar paralysis came on five years after the beginning, and in Bristowe's case it came late, but the time is not stated.

[1] Dr. Birdsall's case has remained unchanged for at least two years.—ED.

The prognosis is undoubtedly not very good, as far as perfect recovery is concerned, but it is likewise not apt to endanger the life of the patient. One recovery is mentioned by Mauthner, in a girl five years old, where the paralysis disappeared in two months without treatment.

Partial restoration of some of the muscles has been observed more frequently. The muscles which seemed most apt to recover some power were the levators of the upper lid, the superior oblique, the inferior recti, and lastly the internal recti, and in very rare instances the superior recti and the inferior obliques.

The clinical history of the cases is simple. If the levator muscles become affected early, and to a considerable extent, the dropping of the upper lid will interfere with the sight of the patient, and this will bring him to seek medical advice early; if the other muscles become affected first and if the disease progresses slowly, the patient may be inconvenienced by it so little that he does not apply for treatment until the disease has advanced considerably. Diplopia does not exist, as a rule, nor is there much exophthalmos which might attract the attention of the patient. This is to be explained by the fact that the oblique muscles, which, acting as antagonists to the externi, pull the eye forward in those cases where these latter alone are paralyzed, are involved in the process, and it is only in the case of Lichtheim where this symptom is mentioned. In Warner's case, the proptosis was thought to be due to Graves' disease. Squint is sometimes observed; it is, as a rule, divergent and of moderate extent. It is usually due to the effort to exclude one eye from vision, especially for near objects. Monocular vision is apt to take the place of binocular vision, even for the distance, if the internal recti are much affected. The eyes being fixed, the patient is not able to look sideways without moving his head; he is apt to pass his friends on the street without recognizing them, nor is he able to write or read with comfort, because he can use only one eye at a time, and has to hold his head in such a way as to favor this eye; nor is he able to read without moving his head or the book; the vision of

the patient remaining otherwise perfectly good, this may be the first thing to call his attention to his eyes. After some time, the patient becomes accustomed to the condition of his eyes, is not inconvenienced by it, nor is the condition likely to attract the attention of his friends if his eyes are deeply set; but in persons with very prominent eyes, the peculiar stare will soon be noticed. If ptosis is present, the deformity of the drooping upper lid will soon become a source of annoyance, and the vision will, as I said before be soon interfered with, but only mechanically.

THE TYPICAL FEATURES AND SYMPTOMS are therefore:

1. COMPLETE IMMOBILITY OF BOTH EYES. This assertion has to be modified to the extent that the eyes will, in the beginning or even after the disease existed for some time have a slight motion sideways, and also downwards, if the patient makes a strong effort.

2. No impairment for distant vision, unless poor vision due to an error of refraction or to corneal opacities, existed before the attack; color perception remains good and the field of vision is not affected.

3. Slight inconvenience for work on small objects, reading or writing, due to loss of power of convergence; but the vision of each eye alone remains as it was before the attack and the power of accommodation does not suffer.

4. There is no visible change of the eyeballs themselves.

5. There is apt to be ptosis; but the drooping of the upper lid is, in some cases, so slight that it can hardly be noticed, whereas, in some, it is so marked that the patient cannot go about unless he forces his eyes open by contractions of the frontalis muscle.

6. The disease is progressive in so far as the ocular muscles become affected one after another, but after these are paralyzed, the disease remains at a standstill, and does not affect other muscles.

The HISTORY of my case is as follows: Mr. E., 30 years old, enjoying perfect health, found that he could not clean or cut his finger-nails without closing one eye and turning

his head. This happened in the fall of 1883, while he was in camp in the Adirondacks. He paid little attention to the fact because his distant vision remained as good as it ever was. In the spring of the following year, after returning to the city, his friends complained that he passed them in the street without seeing or recognizing them. It became likewise annoying to him that, when reading the newspaper, he had either to hold it very far from his eyes or to one side, and even then he had to move his head in order to read, for he could not take in a whole line at a glance. This made him think that there was something wrong with his eyes, and he came to me for glasses. On examining him, I found that he had a slight degree of hypermetropia, but that his vision was perfect in every respect, his color-perception and his field of vision were good, but when I came to examine his muscles with prisms, I found that he had monocular vision, and that there was no convergence of either eye. The left eye was quite fixed, but the right one moved slightly in a downward direction, and a very little inward. There is a slight ptosis of both eyes, a little more marked on the left side, but the patient has acquired the habit of keeping his eyes open by contraction of the forehead to such an extent, that the drooping of the lid is not apparent on superficial examination. There is likewise a very slight divergence of the left eye, which he uses for near vision, whereas the right eye is used for distant vision, although both eyes have equally good visual power. The pupils are moderately small, but act promptly if accommodating, for light and on convergence. Power of accommodation perfect; patient reads fine print in a region from three to twenty inches.

In all other respects the patient enjoys perfect health; has never had headaches, and only the hay fever drives him to the mountains. He has no business and spends most of his time in travelling about. About fifteen years ago, he had an attack of gonorrhœa, which was followed by some symptoms pointing to a specific infection, while there had been no outward initial lesion. For the last ten years I have seen him almost constantly, and he has had

no specific symptoms; but in the spring of 1879, and likewise in 1880, he had an eruption on the back of both hands that lasted several days; it was very itchy, and disappeared after the use of little rhubarb and bicarbonate of soda. The family history of the patient is good, although on his mother's side there is a decided nervous tendency and scrofulous condition, dating from his great-grandfather, but they live, as a rule, to good old age. Patient is a high liver and fond of a good cigar, smoking as many as fifteen of them a day, is unmarried, and a man of excellent physique.

The treatment consisted in the use of the faradic current and the administration of iodide of potash; this drug was given for nearly eighteen months, and at times in very large doses; one hundred and fifty grains were given daily for several weeks. After this it was discontinued, and strychnine given instead, but with little or no result. The ptosis only has improved, and the action of both trochleares is much better than it was for some time. Patient attributes this to the systematic exercise that he gives his eyes daily.

In conclusion, I would state that, inasmuch as there has not been a single autopsy in plain, uncomplicated binocular ophthalmoplegia, the theories in regard to the initial lesion are simply hypothetical. Of the most recent researches, those of Mauthner point to a nuclear origin, whereas Bristowe and others consider it a functional affection; but the probability that it depends upon changes of nutrition of the nuclei or perhaps of some centre of associate movements of the eye, is likewise probable, and when Strümpell emphasizes that the absence of diplopia is due, in all probability, to a diseased condition of ganglion cells presiding over the associate movements, why not go a step farther and say that the whole trouble is due to it? The relation of the trouble to progressive bulbar paralysis and general atrophy is very doubtful to my mind, for the reason that the trouble is usually confined to the eye muscles, and that even these do not remain constantly paralyzed, but recover at times partly, or, as in one of Mauthner's cases, entirely. The probability that the corpora

quadrigemina might be the seat of the affection, is not a strong one, because in the post-mortem case of Warner, made by Bristowe, they were found to be normal on microscopic examination.